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Three new earthworm species of *Microchaetus* Rapp, 1849, and new data on two earlier known species of this genus (Oligochaeta: Microchaetidae)

by

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ABSTRACT

Three new species of the genus *Microchaetus* Rapp, 1949 are described and illustrated: *M. griphus*, *M. herberti* and *M. sophieae*. Notes on biology, relationships and distribution are provided. New localities for two earlier know species, namely *M. pondoanus* Michaelsen, 1913*a* and *M. zaloumisi* Plisko, 1992 are recorded.

INTRODUCTION

This paper is a sequel to my earlier papers (Plisko 1991*a,b* 1992 1993 1995*a,b* 1998 1999) on South African microchaetids of the genus *Microchaetus* Rapp, 1849. A key to the known species of this genus is included in Plisko (1998). The three new species described in this paper are added to the 39 known holandric species.

New records are provided for two previously known species.

MATERIAL AND METHODS

All studied material is housed in the Natal Museum Oligochaeta Collection. It comprises earthworm samples collected recently by colleagues at the Natal Museum and the University of Stellenbosch. Specimens were initially preserved in 75 % ethyl alcohol by collectors, and thereafter transferred by myself into 4 % formalin for one day, than preserved in fresh 75 % alcohol. Descriptions are based on preserved material, apart from data relating to the colour and measurements of living specimens, if such data were recorded at the time of collection. Studies of internal anatomy were done through dorsal dissections. Collection data were taken from the labels supplied with the material; for some specimens additional verbal information obtained from the collectors is also included. Photographs of *M. griphus* (Fig. 1) and *M. sophieae* (Fig. 3) were taken using a Wild photomicroscope, and for *M. herberti* (Fig. 2) using a high resolution flatbed scanner.

TAXONOMY

Microchaetus Rapp, 1849

Microchaetus Rapp, 1849: 143. Type species: *Microchaetus microchaetus* Rapp, 1949 by monotypy.

Microchaetus griphus sp. n.

(Fig. 1)

Etymology: L. *griphus* = riddle, puzzle. Refers to the unusual conjunction of internal characters noted in this species.

Material examined: SOUTH AFRICA: *KwaZulu-Natal*: Richards Bay (28°50'S:32°08'E), from garden soil, 3 May 1998, B. R. Stuckenberg leg: Holotype NMSA/Olig.02752 clitellate, well developed. Paratypes: NMSA/Olig.03545 one clitellate and 5 juveniles collected together with holotype.

Description based on holotype and paratypes.

External characters:

General: Body cylindrical. *Colour*: In life anteriorly violet, postclitellarly only dorsally violet, ventrally grey; preserved in alcohol for over three years, holotype and clitellate paratype manifest violet colouring around their three anterior segments; segments 4–12 violet only dorsally; ventrally yellowish-grey; postclitellarly yellowish-white; juveniles grey, with trace of violet colouring dorsally on first four segments. *Dimensions*: Holotype preserved, contracted, abscised postclitellarly 42 mm long, 5 mm wide at segment 10, 8 mm wide at tubercula pubertatis; clitellate paratype abscised at segment sixty, 43 mm long, 7 mm wide at clitellum; juvenile paratypes 32–72 mm long, 2–4 mm wide. *Segment number*: Holotype 76+, clitellate paratype 60+, juveniles 285–390. *Prostomium*: Prolobous, moderate; clearly separated from first segment. *Segmentation*: Secondary annulation present on preclitellar segments; 1 and 2 short, simple, with clear intersegmental furrow 1/2, both with irregular longitudinal grooves; 3 simple, longer than 2; 4–5 with two ringlets similar in size and appearance; 6–9 with two ringlets, first longer than second; 10–12 and postclitellar segments simple with transversal annulation incomplete. *Setae*: Minute, closely paired; in front of clitellum $aa < bc$, $ab = cd$. Postclitellarly $aa > bc$. *Nephridial pores*: First pair in intersegmental furrow 2/3; near *cd* setae; conspicuous in clitellar intersegmental furrows. *Female pores*: On 14, posteriorly to *cd* setae, below ventral borders of clitellum. *Male pores*: Probably in intersegmental furrow 17/18 where there are small depressions, or in posterior part of segment 18 marked by tiny indents. *Spermathecal pores*: In intersegmental furrows 11/12 and 12/13.

Clitellar region (Fig. 1): *Clitellum*: Saddle-shaped, elongated, clearly segmented, white; extends over segments 13–25; ventral borders nearly in *cd* setal lines; on segments 17–20 separated from tubercula pubertatis by deep longitudinal furrows. *Tubercula pubertatis*: On holotype nearly square glandular bands, rounded at corners, on segments 17–19, extending partly on 20; rimmed all around, separated from clitellum by elongated, deep depressions. On one incompletely mature paratype the tubercula differ slightly in shape, being rather elongated bands, much narrower than these observed on holotype; separated from clitellum by deep furrows on segments 17–20, and rimmed ventrally. *Papillae*: On holotype one pair of large glandular swellings on segment 13; on paratype paired on 13 and 14. In both cases associated with genital glands.

Internal characters:

Septa: 4/5 and 6/7 thickened moderately, partly muscular, firm; 5/6 thickened the most, muscular and much thicker than both neighboring septa; 7/8 and 8/9 thickened less than 4/5 or 6/7, however firm. *Gizzard*: Cylindrical, muscular, in 7. *Calciferous glands*: In 9 large hemispherical glands, clearly separated dorsally and ventrally. *Intestine*: Commences in 13. *Typhlosole*: Commences in 19 as very thin, V-shaped tube, slightly enlarging posteriorly; termination could not be established because both mature specimens were abscised close to clitellum. *Dorsal blood vessel*: In 4–5 very thin, simple; 6–7 double in posterior part of

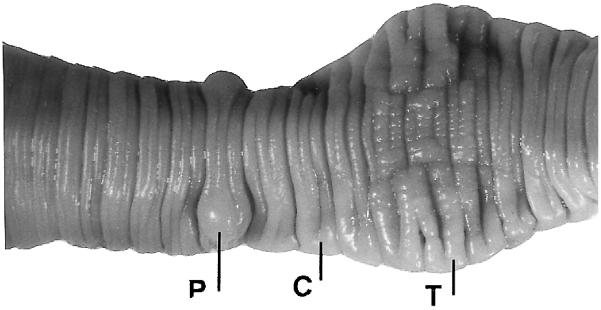

Fig. 1. *Microchaetus griphus* sp. n. Clitellar region, ventral view with clitellum and tubercula pubertatis. C = clitellum. T = tubercula pubertatis; P = papilla of segment 13.

segments, thin, close; in 8 double, thin, widely separated; in 9 enlarged, double, cordiform. *Paired dorsoventral vessels*: 4–8 simple, thin tubes; 9–11 enlarged, moniliform. *Nephridia*: Meganephridia; coiled loops with clear V-shaped caeca.

Reproductive organs: *Spermiductal funnels*: Holandric arrangement (two pairs); in segment 10 and 11; anterior pair located ventro-laterally, closely connected with seminal vesicles at septum 10/11; posterior pair very much ventrally, connected and enclosed with seminal vesicles at their ventro-lateral sides. Detection of the second pair is only possible by bending laterally the dorsal sides of seminal vesicles and investigating their ventral position. *Vasa deferentia*: Commencing on lateral sides of spermiductal funnels in segments 10 and 11 respectively, extending transversely before curving posteriorly to run to anterior parts of segment 12 where they become very close, and run backward to posterior parts of segment 17; penetrations into body wall occur at intersegmental furrow 17/18, where both ducts enter into anterior parts of segment 18. *Seminal vesicles*: In holotype a pair of large sacs commencing at septum 10/11, extending into segment 11 as nearly square vesicles with elongated, curved extensions situated dorsally in segment 12; both vesicles at their ventral bases enclose spermiductal funnels of segments 10 and 11 respectively. In paratype anterior parts of vesicles extend into segment 11 as irregularly shaped elongated sacs with narrow extensions protruding into segment 12. *Spermathecae*: Small, bent or coiled, elongated thecae in segments 11 and 12; two per segment, distant, close to septa 11/12 and 12/13. *Ovaries*: In posterior part of segment 13 in shape of ribbon-folded rosette. *Genital glands*: In holotype one pair of oval, flat glands in segment 13, associated with papillae. In paratype paired, flat, rosette-shaped, in segments 13 and 14, also associated with papillae.

Distribution: Known only from the type locality in KwaZulu-Natal.

Biological notes: Found in a garden containing indigenous trees and shrubs, in the Meer-en-See section of Richards Bay. This locality is immediately inland of the coastal dunes, where many vestiges of sand forest and bush still occur among the houses; originally the area must have been densely wooded. Although the soil is loose, very sandy, and lacking in humus, it supports luxuriant vegetation with many trees, probably because the water table is not far below the surface, as is shown by the many small bodies of open water occuring permanently in depressions in the area. Two mature specimens collected together with five juveniles suggest an ability of the species living in cultivated soil; however, its extended adaptation cannot be confirmed.

Discussion: This species is considerably distinctive from other known holandric species. The occurrence of spermiductal pores in intersegmental furrows 11/12 and 12/13 is known in *caementerii* Michaelsen, 1913*b*, the only other species of this genus with this characteristic. No other similarity between these two species was noted. They differ in body size, shapes and positions of clitellum, tubercula pubertatis and seminal vesicles, and in the number of thickened septa.

Microchaetus herberti sp. n.

(Fig. 2)

Etymology: Named for Dr D. G. Herbert of the Natal Museum's Department of Malacology, who collected and donated the type material to the Oligochaeta Department.

Material examined: SOUTH AFRICA: *KwaZulu-Natal*: Holotype NMSA/Olig.03484, clitellate, Port Shepstone area, Marble Delta (30°39.056'S: 30°21.361'E) under accumulated layer of litter in dense valley thicket/woodland, heavily invaded by *Lantana* and *Chromoleana*, 5 October 2001. Paratypes: NMSA/Olig.03485, 1 with absorbed clitellum and 1 juvenile, collected together with holotype; NMSA/Olig.03483, 1 clitellate, under stone in Oribi Gorge Nature Reserve (30°43.5'S:30°16.5'E) in scarp forest on SE side of Umzimkulwana River, 5 October 2001. Other material: Port Shepstone area: NMSA/Olig.03536, Marble Delta, north side of Umzimkulwana River at base of Simuma Hill (30°40.367'S:30°20.563'E) in dense riverine thicket/woodland, heavily invaded with *Lantana* and *Chromoleana*, in deep leaf-litter/soil, 4 December 2001, 4 clitellate and 5 juvenile; NMSA/Olig.03538, Marble Delta, in badly degraded bush clumps in quarry site (30°39.08'S:30°21.5'E), under large log, 5 December 2001, 4 clitellate; NMSA/Olig.03539, Natal Portland Cement Nature Reserve (30°40.456'S:30°20.299'E) in dense riverine woodland, not on limestone, under stones and in leaf-litter, 4 December 2001, 3 clitellate and 1 juvenile. All material collected by D. G. Herbert.

Description based on holotype and paratypes.

External characters:

General: Body cylindrical. *Colour*: In life dorsally violet, ventrally yellowish-grey; alcohol-preserved dark grey dorsally on whole length of body, ventrally light grey. *Dimensions*: Holotype preserved and slightly contracted 367 mm long, 10 mm wide at segment 10, 18 mm wide at tubercula pubertatis; paratype 334 mm long, 12 mm wide at segment 10, 18 mm at tubercula pubertatis. *Segment number*: Holotype 278. *Prostomium*: Prolobous, large, with deep longitudinal grooves. *Segmentation*: Secondary annulation present on preclitellar segments: segments 1 and 2 short, both with longitudinal grooves; 3 simple; 4–8 with simple, irregularly annulated ringlets, similar in size and appearance; 9 with two ringlets, second shorter than first; 10 and following segments simple, postclitellar randomly annulated. *Setae*: Moderate in size, closely paired; first pairs on segment 3; on 4–9 on first ringlet; on segment 10 $ab = cd$, $aa < bc$; on segments 15–24 *ab* setae much enlarged, associated with papillae and genital glands. *Nephridial pores*: Conspicuous in *cd* setal lines; first pair in intersegmental furrow 3/4. *Female pores*: Not observed, probably embedded in wall tissue of segment 14. *Male pores*: In intersegmental furrow 15/16, marked by small depressions, laterally to rimmed anterior parts of genital fields. *Spermathecal pores*: In intersegmental furrows 13/14 and 14/15, minute, difficult to trace.

Clitellar region (Fig. 2): *Clitellum*: On holotype and one mature paratype well developed, saddle-shaped, over segments 13–24, dorsally extending into a small portion of 25; anteriorly clearly bordered, parallel with intersegmental furrows; lateral edges on 13–14 along with *cd* setae, on 1/n15–1/n19 slightly below dorsal edges of tubercula pubertatis; on 1/n19–24 parallel with rims of genital fields. *Tubercula pubertatis*: Glandular ridges with deep irregular grooves, on 1/n15–1/n19; nearly rectangular with rounded corners, rimmed; on segments 16 and 18 at their dorsal corners bordering with clitellum a pair of triangular cushions overlapping clitellum edge. *Genital fields*: Two separated, elongated glandular cushions, rimmed laterally, extending backward over segments 15–24; the median distances between both cushions on 15–18 are nearly equal to width of glandular cushion; on the following segments distances increase and become at 24 nearly twice that on 15. *Papillae*: On segments 13–24 associated with large genital setae.

Internal characters:

Septa: 4/5 thickened, strong, elastic; 5/6 thin, 7/8 8/9 very much thickened, muscular, massive; following septa thin but firm. *Gizzard*: Globular, in segment 7; posteriorly softened. *Calciferous glands*: In segment 9, small, muscular, hemispherical glands, laterally adherent to oesophagus, clearly separated dorsally and ventrally. *Intestine*: Commences in 13. *Typhlosole*: Commences abruptly as very thick, folding tube in segment 22; in holotype terminates in segment 198. *Dorsal blood vessel*: Double in 5–9; in 5–7 thin tubes, close one to another; in 8 widely separated; in 9 two enlarged vessels forming cordiform organ. *Paired dorsoventral vessels*: Present in segments 5–11; 5–8 thin vessels, in 9–11 very much enlarged, moniliform 'hearts'. *Nephridia*: Meganephridia; large coiled loops and elongated V-shaped caeca, one pair per segment.

Reproductive organs: *Spermiductal funnels*: Holandric arrangement (two pairs); in 10 and 11; large, iridescent, enclosed in separated sacs. *Vasa deferentia*: Commence in segments 10 and 11 respectively on lateral sides of spermiductal funnels, and extend transversely before curving posteriorly to run backward separately, parallel to axis of body, to posterior part of segment 15, where they enter body wall and consequently male pores. *Seminal vesicles*: Two pairs sacs commencing at posterior parts of septa 10/11 and 11/12 respectively; large pouches closely confined to spermiductal funnels of segments 10 and 11 extend into segments 11 and 12 respectively. *Spermathecae*: Irregularly shaped, small thecae deeply embedded in body wall of segments 13 and 14,

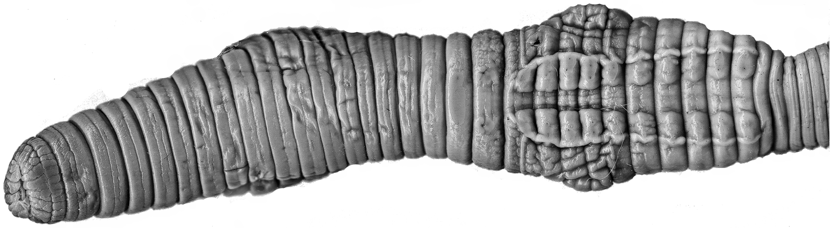

Fig. 2. *Microchaetus herberti* sp. n. Ventral view of anterior part of body with clitellar region and tubercula pubertatis.

with their pores at intersegmental furrows 13/14 and 14/15. Number of spermathecae varies; in holotype in segment 13 at its left side were 11 spermathecae, in segment 14 were 17 thecae; in dissected paratype were 7 thecae in segment 13, and 17 thecae in segment 14. In the other paratype no spermathecae were found at right side of segment 13, being probably deeply embedded in body wall. *Ovaries*: Not detected. *Genital glands*: Not observed. *Genital setae*: In segments 15–24; in each segment two large setae in one oblong tube; associated with papillae and genital fields.

Distribution: Known from the southern KwaZulu-Natal coastal hinterland area. Found in protected area of Oribi Gorge Nature Reserve, and along the lower Umzimkulwana River; possibly also occurring along the Umzimkulu River.

Biological notes: Collected at the confluence of the Umzimkulu and Umzimkulwana Rivers, known as Marble Delta. The area constitutes one of the few limestone deposits in KwaZulu-Natal. Currently it is heavily exploited as a mineral resource and there is massive habitat degradation. Rehabilitation of the quarried area is minimal, and the area is heavily infested with alien plants. The vegetation ranges from patches of grassland on the exposed ridges, to valley thicket and denser thicket/woodland in the south-facing gullies and valleys. The holotype was found in dense valley thicket/woodland under accumulated litter. Other specimens were found near the holotype locality, on the bank of the Umzimkulwana River in scarp forest in the Oribi Gorge Nature Reserve, where no limestone occurs. Finding of paratypes in the much higher area of the Oribi Gorge Nature Reserve suggests the possibility of species transportation in the water of the Umzimkulwana River running through the Reserve up to the area of Marble Delta. Species occurrence in a much-degraded habitat, in an area with soil rich with calcium, suggests an ability to adapt to degraded conditions. However, it is worth noting that in the paratype gathered together with the mature holotype, the clitellar area is marked by brownish colour, and both seminal vesicles are slightly reduced. This could suggest species regression, followed by aestivation, quiescence or facultative phases caused by dryness in this area in June–September, or indicate unfavourable environmental conditions.

Two fully developed specimens collected in October suggest sexual reproduction at the beginning of the rainy season, which starts at the end of September. The species is associated with *M. zaloumisi* Plisko, 1992.

Discussion: Similar to *M. natalensis* (Kinberg, 1867). In both species the spermathecal pores occur in intersegmental furrows 13/14 and 14/15, and the calciferous glands are in segment 9. However, *herberti* is much larger than *natalensis*, and its tubercula pubertatis and genital fields differ in shape conspicuously.

Microchaetus pondoanus Michaelsen, 1913

Microchaetus pondoanus var. typica Michaelsen, 1913*a*: 542.
Microchaetus pondoanus var. *minor* Michaelsen, 1913*a*: 547; Reynolds & Cook 1976: 137.
Microchaetus pondoanus: Pickford 1975: 23; Reynolds & Cook 1976: 157; Plisko 1992: 339, 1993: 236, 1998: 288.

Material examined: SOUTH AFRICA: *KwaZulu-Natal*: NMSA/Olig.03361 and NMSA/Olig.03362 Mkambati Nature Reserve, Super Bowl at junction of Msikaba and Kwadlambu Rivers (31°17.728'S:29°55.752'E) and (31°17.872'S:29°55.765'E) below soil surface, 5 March 2001: 6 mature + 1 juvenile and 2 mature respectively. Collected by D. G. Herbert. All mature specimens have clitella marked by brownish colouring.

Distribution: Known from a limited area of the north-eastern Eastern Cape Province, and from south-eastern KwaZulu-Natal.

Microchaetus sophieae sp. n.

(Fig. 3)

Etymology: Named for Dr Sophie Reinecke of the Zoology Department, University of Stellenbosch, who supervised the collection of the type material and donated it to the Natal Museum Oligochaeta Collection.

Material examined: SOUTH AFRICA: *Western Cape*: Holotype NMSA/Olig.03548, Nieuwoudtville (31°22'S:19°06'E) from arable field under fungicide experiment, 17 July 1998, M. Maboeta leg. Paratypes: NMSA/Olig.03549, 3 clitellate collected with holotype.

Description based on holotype and paratypes.

External characters:

General: Body cylindrical, firm. *Colour*: Alcohol-preserved: prostomium and segments 1–2 violet all around; other segments dorsally violet, ventrally grey. *Dimensions*: Preserved and contracted holotype 112 mm, 5 mm wide at segment 10, 7 at tubercula pubertatis; paratypes 100–130 mm long, 4–5 mm wide at segment 10, 6–7 mm at tubercula pubertatis. *Segment number*: 300–342. *Prostomium*: Prolobous, large. *Segmentation*: Secondary annulation present on preclitellar segments; segments 1 and 2 fused, with irregular longitudinal grooves; segment 3 simple, as long as first ringlet of segment 4; 4–9 with 2 ringlets, first longer than second; 10 and 11 short, simple, irregularly annulated; 12 and clitellar segments simple, smooth; postclitellar much shorter than preclitellar, simple, randomly annulated. *Setae*: Minute, closely paired; postclitellarly $ab = cd$, $aa < bc > dd < 1/2u$; first pairs on segment 3. *Nephridial pores*: Much ventral to *cd* setal lines; on clitellar segments conspicuous, postclitellarly difficult to trace. *Female pores*: In 14 between *bc* setae. *Male pores*: Large openings on 18 in area of tubercula pubertatis. *Spermathecal pores*: Clearly visible in intersegmental furrows13/14 14/15 15/16 close to nephridial pores.

Clitellar region (Fig. 3): *Clitellum*: Extends over segments 13–22, saddle-shaped, with simple, smooth segments; clearly bordered anteriorly and posteriorly, with ventral edges above *ab* setal lines. *Tubercula pubertatis*: Oblong, flat pads, overlapping clitellum on 17–1/n20; dorsal edges below nephridial pores, ventral edges slightly above *b* setal lines at ventral edges of clitellum. *Papillae*: Paired, minute swellings, various shapes and sizes, associated with *ab* setae; on segments 10–23.

Internal characters:

Septa: 4/5 thickened only a little, 5/6 7/8 8/9 thickened moderately, firm, not muscular; 6/7 thinner than 4/5; 8/9 slightly thickened, however, thinner than 4/5; other septa thin, firm. Variation in thickness of septa observed. *Gizzard*: In 7, bell-shaped, firm, widened and softened posteriorly. *Calciferous glands*: In 10, paired, small glands, lateral, clearly separated dorsally and ventrally. *Intestine*: Commences in 12. *Typhlosole*: In paratype with 300 segments, commences immediately with intestine as narrow tube, gradually changing into V-shaped structure; terminates in segment 188. *Dorsal blood vessel*: Undivided, simple over its whole length; slender vessel in 4–7, enlarged in 8, in 9 thick

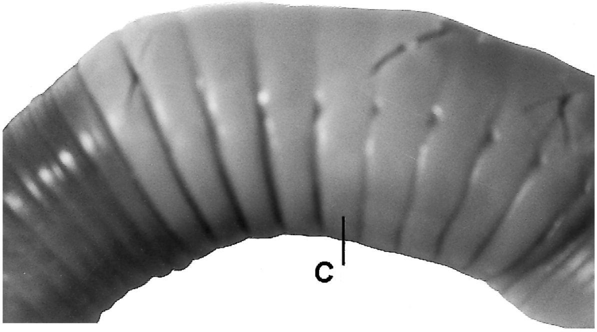

Fig. 3. *Microchaetus sophieae* sp. n. Lateral view of clitellum. C = clitellum.

organ; posteriorly simple, moderate in size. *Paired dorsoventral vessels*: In 4–7 simple thin vessels, in 8–11 enlarged, moniliform. *Nephridia*: Meganephridia; in clitellar segments thin, coiled loops with J-shaped slender tubes.

Reproductive organs: *Spermiductal funnels*: Holandric arrangement (in 10 and 11); large, free funnels, iridescent, containing sperm. *Vasa deferentia*: Two pairs of ducts commence from lateral sides of spermiductal funnels, extending transversely in 10 and 11 before curving posteriorly to run backward parallel to axis of body; two ducts being initially separated in segment 10 and 11, in the following segments become very close one to another and run to segment 18, where they enter body wall in posterior part of segment, and into male pores. It is not clear if double ducts fuse before entering male pores. *Seminal vesicles*: Two pairs of sacs commencing at posterior parts of septa 10/11 and 11/12 respectively; each pair of different size and appearance; an anterior pair being much smaller than the posterior pair curving dorsally and confined to segment 11; posterior pair commencing at septa 11/12 and forming bulged, dissimilar pouches extending backwards differently on left and right side; in holotype the left vesicle extends to segment 16, the right vesicle to segment 18; in paratypes left vesicle extends to segments 16–18, right one to 16 or 17 or 19. Variation in shapes, sizes and extension of posterior pairs were noted in dissected specimens. *Spermathecae*: In holotype in segments 13 14 16, in paratypes in 13 14 15; paired, globular, large iridescent ampullae with long, slender ducts entering body wall at intersegmental furrows 13/14 14/15 15/16; in one paratype were two spermathecae at left side of segment 13. Iridescence confirming presence of sperm observed in all spermathecae. *Ovaries*: Not observed. *Genital glands*: Single or paired, small to minute oval bladders, in segments 10–23. Some of the glands contain genital setae.

Distribution: Known only from the type locality in southwestern South Africa, in the Namaqualand escarpment mountains of the Western Cape Province.

Biological notes: Found in a cultivated field undergoing fungicide treatment. It is not know if the species survived this treatment. Presence of iridescent sperm in the spermiductal funnels and in all spermathecae of dissected specimens indicates sexual activity in winter, when temperatures can be very low, sometimes reaching 0 °C.

Discussion: Belongs to the group of species with seminal vesicles extended backwards over more than two segments. Most similar to *M. ljungströmi* Pickford 1975, having paired spermathecae in three segments, and spermathecal pores in intersegmental furrows 13/14 14/15 15/16. Both species are characterised by extension of the posterior pair of seminal vesicles. However, in *ljungströmi* seminal vesicles are located in segments 10 and 11, whereas in *sophieae* they are in 11 and 12. These two species differ also in the shape of the nephridia, position and shape of the tubercula pubertatis, and thickness of anterior septa.

Microchaetus zaloumisi Plisko, 1992

Microchaetus zaloumisi Plisko, 1992: 352.
Microchaetus zaloumisi; Reynolds & Cook 1976: 22; Plisko 1993: 236;1998: 293.

Material examined: *KwaZulu-Natal*: NMSA/Olig.03537, Port Shepstone area, Marble Delta, north side of Umzimkulwana River at base of Simuma Hill (30º40.367'S:30º20.563'E), in dense riverine thicket/woodland, heavily invaded with *Lantana* and *Chromoleana*, in deep leaf-litter/soil, 4 December 2001, 1 clitellate + 2 juvenile, D. G. Herbert leg.

Distribution: Described from Vernon Crookes Nature Reserve situated in southern coastal KwaZulu-Natal. This new locality record suggests that the species may range widely in the coastal lowlands of KwaZulu-Natal.

Biological notes: The type locality and other localities where the species was previously collected are all in the protected area of the reserve. Present data suggest that the species is able to adapt to degraded fields. *M. zaloumisi* is associated with the new species *herberti*.

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